

REMARKS

By the present amendment, claims 1 and 2 have been amended to obviate the examiner's objections thereto and/or to further clarify the concepts of the present invention. More particularly, independent claim 1 has been amended to, among other things, incorporate subject matter from dependent claim 5 therein and claim 5 has been canceled accordingly. Further, dependent claims 6, 7 and 8 have been canceled. Entry of these amendments is respectfully requested.

In the Office Action, claims 1, 2 and 6-8 were rejected under 35 USC § 103(a) as being unpatentable over the patent to Smith et al in view of the patents to Lee et al and Kawazura et al. As before, it was asserted in making this rejection that the Smith et al patent teaches the entire hose as set forth in the noted claims with two exceptions. In particular, it was acknowledged that the Smith et al patent does not teach (1) a polyester resin having particles of a core-shell structure in the recited proportions and (2) other layers of a polyester resin material.

Thereafter, it was asserted that (1) the use of such particles in conjunction with a polyester resin so as to provide gasoline resistance and flexibility in cold environments is taught by the Lee et al patent and therefore their use in the hose according to the Smith et al patent would be obvious to one of ordinary skill in the art. Further, it was asserted that (2) the use of a polyester resin material for another layer is taught by the Kawazura et al

patent and therefore its use in the hose according to the Smith et al patent would be obvious to one of ordinary skill. Reconsideration of this rejection in view of the above claim amendments and the following comments is respectfully requested.

As was set forth above, independent claim 1 has been amended herein to incorporate subject matter from dependent claim 5 therein. Thus, it is submitted that the subject rejection is now moot. Accordingly, withdrawal of the rejection under 35 U.S.C. § 103(a) and allowance of claims 1 and 2 as amended over the cited patents are respectfully requested.

Claim 5 again was rejected under 35 USC § 103(a) as being unpatentable over the same patent to Smith et al in view of the patent to Lee et al further in view of the patents to Kawazura et al and Shah et al. In addition, claim 5 also was rejected under 35 USC § 103(a) as being unpatentable over the same patent to Smith et al in view of the patent to Lee et al further in view of the patents to Kawazura et al, Gilbert et al and Han et al. In each of the rejections, the first three cited patents were relied upon as in the initial rejection, and the additionally patent or patents were cited for allegedly showing the use of an amine-rich resin for promoting adhesion between polymeric layers. Reconsideration of these rejections in view of the following comments is respectfully requested.

Before discussing the rejection in detail, a brief review of the presently claimed invention may be quite instructive. As recited in amended claim 1, the invention relates to a fuel hose having a plural layer structure including an inner layer, an intermediate layer and an outer layer. The inner layer comprises at least one first polyester resin selected from the group consisting of polybutylene terephthalate, polybutylene naphthalate, polyethylene terephthalate and polyethylene naphthalate, and particles each having a core-shell structure, the particles being present in a proportion of 5 to 60 parts by weight based on 100 parts by weight of the polyester resin. The intermediate layer comprises at least one second polyester resin selected from the group consisting of polybutylene terephthalate, polybutylene naphthalate, polyethylene terephthalate and polyethylene naphthalate, the intermediate layer adjacent to the outer layer having a plasma-treated outer peripheral surface.

An important feature of the structure of the fuel hose as claimed, among others, is that the outer layer essentially comprises an amine-rich resin having an amino group content not smaller than about 4×10^{-5} g-equivalents/g, the outer layer being laminated on the plasma-treated outer peripheral surface of the intermediate layer. The use of the amine-rich polyamide resin as the outer layer material of the fuel hose improves flexibility (low-temperature flexibility) and adhesiveness as is set forth on page 15, first paragraph of the subject specification. Since the amine-rich polyamide resin hardens at low temperature and has strength, deterioration of the hose can be restrained. Therefore, the hose having the outer layer formed of the amine-rich polyamide resin is superior in low-

temperature impact resistance to a hose having an outer layer formed of a thermoplastic elastomer (TPEE).

Furthermore, the outer layer essentially comprising the amine-rich polyamide resin is laminated on the intermediate layer through a plasma-treated outer peripheral surface of the intermediate layer. As a consequence, adhesiveness between these layers is good, and the layers can be bonded without interposing an adhesive layer therebetween, whereby advantageous operability can be provided as is set forth on page 19, first paragraph of the subject specification.

The above advantageous effects are illustrated in greater detail in the following with reference to the Examples contained in the subject specification. First, Example 17 (a comparative example outside the scope of the amended claims) and Example 18 (according to the presently claimed invention) in Table 3 of the original specification are compared. The hose of Example 18 has the outer layer formed of the amine-rich PA12 and is directly laminated on the intermediate layer A formed of PBN through a plasma-treated surface of the intermediate layer A. It is to be noted that the layers have an excellent interlaminar adhesiveness, and thus the intermediate layer A (PBN) and the other layer (amine-rich PA12) can be bonded without an adhesive layer.

In distinct contrast, the hose of Example 17 has the outer layer formed of a normal PA12 (not the amine-rich PA12) and the outer peripheral surface of the intermediate layer

A is not plasma treated. It is to be particularly noted that the layers are inferior in interlaminar adhesiveness, and thus an adhesive layer (intermediate layer B) is provided between the intermediate layer A (PBN) and the outer layer (PA12).

In a similar manner, Example 19 (a comparative example outside the scope of the amended claims) and Example 20 (an example in accordance with the presently claimed invention) in Table 4 of the subject specification are compared. The hose of Example 20 has the outer layer formed of the amine-rich PA12 and is directly laminated on the intermediate layer B of PBN through a plasma-treated surface of the intermediate layer B. It is to be noted that the layers have an excellent interlaminar adhesiveness, and thus the intermediate layer B (PBN) and the outer layer (amine-rich PA12) can be bonded without an adhesive layer.

In distinct contrast, the hose of Example 19 has the outer layer formed of a normal PA12 (not the amine-rich PA12) and the outer peripheral surface of the intermediate layer B is not plasma treated. It is to be particularly noted that the layers are inferior in interlaminar adhesiveness, and thus an adhesive layer (intermediate layer C) is provided between the intermediate layer B (PBN) and the outer layer (PA12).

Further, since the outer layers of the hoses of Examples 18 and 20 are formed of amine-rich PA12 which hardens at a low temperature and has strength, deterioration of the hose can be restrained. Therefore, the hoses of Examples 18 and 20 (in accordance with

the presently claimed invention) are superior in low-temperature impact resistance to the hoses of Examples 8 and 12 (these examples being comparative examples outside the scope of the presently amended claims) having outer layers formed of a thermoplastic elastomer (TPEE (1)). It is submitted that the hoses as presently claimed are not taught or suggested by the patents to Smith et al, Lee et al, Kawazura et al, Shah et al, Gilbert et al and Han et al, whether taken singly or in combination.

The previously submitted comments regarding the teaching deficiencies of the Smith et al, Lee et al, and Kawazura et al patents are reiterated with regard to this rejection. Suffice it to say that these three patents do not teach or suggest, as is presently claimed, a fuel hose which includes an outer layer essentially comprises an amine-rich resin having an amino group content not smaller than about 4×10^{-5} g-equivalents/g, the outer layer being laminated on the plasma-treated outer peripheral surface of the intermediate layer.

It is submitted that these teaching deficiencies of the Smith et al, Lee et al, and Kawazura et al patents are not supplied by the patents to Shah et al, Gilbert et al and Han et al. More particularly, the patent to Shah et al merely discloses a multi-layer thermoplastic alloy in which a tie-layer contains amine for adding a reactive functional group. The Shah et al patent fails to teach or suggest an amine-rich polyamide resin having amino group content not smaller than about 4×10^{-5} g-equivalents/g.

The Gilbert et al patent discloses that polyethylene imine is provided between plastic sheets for promoting adhesion of extruded polyethylene after electrically treated in a polyolefin packaging material treating process. However, the material subjected to an electrical treatment is the extruded polyethylene in the Gilbert et al patent. Such is clearly different from the intermediate layer material of the present invention, namely, a layer comprising at least one second polyester resin selected from the group consisting of polybutylene terephthalate, polybutylene naphthalate, polyethylene terephthalate and polyethylene naphthalate.

Furthermore, the hose structures according to the Gilbert et al patent are clearly different from the hose structure as presently claimed. Among other things, the Gilbert et al patent discloses that polyethylene imine is provided between plastic sheets. In contrast, the presently claimed invention is directed to a fuel hose having a plural-layer structure comprising an inner layer, an intermediate layer, and an outer layer, and the outer layer is formed of amine-rich polyamide resin.

Additionally, the Gilbert et al patent fails to disclose that the surfaces of the plastic sheets are plasma-treated surfaces. The fuel hose of the presently claimed invention has a plasma treatment on the outer peripheral surface of the intermediate layer which activates and roughen the surface, thereby providing an excellent interlaminar adhesiveness between the intermediate layer and the outer layer formed of amine-rich polyamide resin.

The Han et al patent merely discloses an amine or an imine as an electrically conductive material, and fails to disclose the amine-rich polyamide resin having amino group content not smaller than about 4×10^{-5} g-equivalents/g. In distinct contrast, as described above, the presently claimed invention is directed to a fuel hose having an intermediate layer formed of a specific material (comprising at least one second polyester resin selected from the group consisting of polybutylene terephthalate, polybutylene naphthalate, polyethylene terephthalate and polyethylene naphthalate), and the outer peripheral surface of the intermediate layer adjacent to an outer layer of the hose is a plasma-treated surface, onto which the outer layer essentially comprising an amine-rich polyamide resin having an amino group content not smaller than about 4×10^{-5} g equivalents/g is laminated.

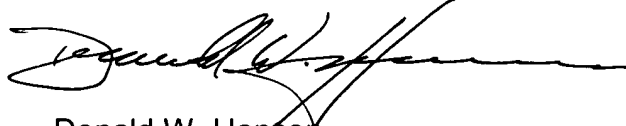
In summary, the use of the amine-rich polyamide resin as a material for an outer layer of a fuel hose improves flexibility (low-temperature flexibility), adhesiveness, and low-temperature impact resistance. Further, since the outer layer essentially comprising an amino-rich polyamide resin is laminated on the intermediate layer through the plasma-treated surface thereof, adhesiveness between these layers is good, and the layers can be bonded without interposing an adhesive layer therebetween. It is submitted that the above advantageous features of the presently claimed invention are neither taught or nor suggested in the cited patents. Accordingly, withdrawal of the rejection under 35 U.S.C. § 103(a) and allowance of claims 1 and 2 as amended over the cited patents are respectfully requested.

In view of the foregoing, it is submitted that the subject application is now in condition for allowance and early notice to that effect is earnestly solicited.

In the event this paper is not timely filed, the undersigned hereby petitions for an appropriate extension of time. The fee for this extension may be charged to Deposit Account No. 01-2340, along with any other additional fees which may be required with respect to this paper.

Respectfully submitted,

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